

## **Appendix 2-D**

### **Applicable Design Standards**



**Table 2D-1**  
Transportation

Impact Category	Project Features	Applicable Design Standards
Alteration of existing state and local roadways	Alignment (bridges and viaducts).	<p>HST Fresno to Bakersfield Section Transportation Technical Report</p> <p>HST Fresno to Bakersfield Section Ridership and Revenue Technical Report</p> <p>International Electrotechnical Commission (IEC)</p> <p>Federal Railroad Administration (FRA) Standards and Guidelines</p> <p>Federal Emergency Management Agency (FEMA) Guidelines</p> <p>Federal Highway Administration (FHWA) Guidelines</p> <p>National Earthquake Hazards Reduction Program (NEHRP)</p> <p>U.S. Army Corps of Engineers Guidelines</p> <p>U.S. Bureau of Land Management Surveying Manual</p> <p>United States Geological Survey (USGS) Standards</p> <p>AASHTO Highway Drainage Guidelines</p> <p>AREMA Manual for Railway Engineering</p> <p>California Disabled Accessibility Guidebook (CalDAG)</p> <p>California Seismic and Safety Commission Standards and Guidelines</p> <p>California Occupational Safety and Health Administration (Cal/OSHA) Standards</p> <p>California Department of Transportation Bridge Design Manuals</p> <p>Caltrans Seismic Design Criteria ver. 1.4 (CSDC))</p> <p>Caltrans Highway Design Manual</p> <p>Chapter 80 – Application of Design Standards</p> <p>Chapter 200 – Geometric Design</p> <p>Chapter 300 – Geometric Cross Section</p> <p>Chapter 400 – Intersections At Grade</p> <p>Caltrans Plans Preparation Manual</p> <p>Caltrans Project Development Procedures Manual</p> <p>Caltrans Standard Plans</p> <p>Caltrans Surveys Manual</p> <p>Caltrans Transportation Management Planning Guidelines</p> <p>Caltrans User's Guide to Photogrammetric Products and Services</p> <p>Caltrans Right of Way Manual, and Forms and Exhibits</p> <p>BNSF Railway Engineering Standards</p> <p>Union Pacific (UP) Railroad Engineering Standards</p>

**Table 2D-1**  
Transportation

Impact Category	Project Features	Applicable Design Standards
		Amtrak Standards and Guidelines Peninsula Corridor Joint Powers Board (Caltrain) Design Criteria and Engineering Standards Southern California Regional Rail Authority (SCRRA) Engineering Standards Public Utilities Commission(s) Regional Water Quality Control Boards Air Quality Districts Flood Control Districts

**Table 2D-2**  
Air Quality

Impact Category	Project Features	Applicable Design Standards
Construction	HST civil work and track construction (alignment, bridges and viaducts).	<p>HST Fresno to Bakersfield Air Quality Technical Report</p> <p>CHST shall comply with the California Air Resources Board (CARB), including the following California air basins:</p> <ul style="list-style-type: none"> <li>• Sacramento Valley</li> <li>• San Francisco Bay Area</li> <li>• San Joaquin Valley</li> <li>• Mojave Desert</li> <li>• South Coast</li> <li>• San Diego County</li> </ul> <p>Emissions shall be tracked by CARB and include ozone, carbon monoxide, carbon dioxide, hydrogen sulfate, methane, NOx, PM2.5, PM10, sulfur dioxide, and lead</p>
Operations	HST Operations	<p>HST Fresno to Bakersfield Air Quality Technical Report</p> <p>CHST shall comply with the California Air Resources Board (CARB), including the following California air basins:</p> <ul style="list-style-type: none"> <li>• Sacramento Valley</li> <li>• San Francisco Bay Area</li> <li>• San Joaquin Valley</li> <li>• Mojave Desert</li> <li>• South Coast</li> <li>• San Diego County</li> </ul> <p>Emissions shall be tracked by CARB and include ozone, carbon monoxide, carbon dioxide, hydrogen sulfate, methane, NOx, PM2.5, PM10, sulfur dioxide, and lead</p>

**Table 2D-3**  
Noise and Vibration

Impact Category	Project Features	Applicable Design Standards
Construction	HST civil work and track construction (alignment, bridges and viaducts).	HST Fresno to Bakersfield Noise and Vibration Technical Report FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment Guideline
Operation of the CHST system and ancillary sources	Alignment (bridges and viaducts).	HST Fresno to Bakersfield Noise and Vibration Technical Report FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment Guideline

**Table 2D-4**  
EMF/EMI

Impact Category	Project Features	Applicable Design Standards
Electromagnetic compatibility of HST equipment and facilities with themselves, and with equipment and facilities of HST neighbors.	HST Systems	46 CFR 15, Subpart B, Sections 15.107(a) and 15.109(b) for Class A digital devices  European Committee for Electrotechnical Standardization (CENELEC) Standard EN 50121-4, Railway Applications – Electromagnetic Compatibility, Part 4: Emissions and Immunity of Signaling and Telecommunications Apparatus
Electromagnetic compatibility of HST equipment and facilities with passengers, workers, and neighbors of the HST.	HST Systems	IEEE Standard C95.6-2002 – IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz  IEEE Standard C95.1-2005 – IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz  FCC OET Bulletin 65 Edition 91-01 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

**Table 2D-5**  
Public Utilities and Energy

Impact Category	Project Features	Applicable Design Standards
New construction and the protection, support, restoration, and rearrangement of utilities	Alignment (bridges and viaducts).	<p>Code of Federal Regulations (CFR), Title 49  California Public Utilities Commission (CPUC) General Orders (GOs), Public Utility Codes, Rules of Practice and Procedure, and the Policies and Guidelines  National Fire Protection Association (NFPA) Standards  Caltrans Highway Design Manual</p> <ul style="list-style-type: none"> <li>Chapter 80 – Application of Design Standards</li> <li>Chapter 200 – Geometric Design</li> <li>Chapter 300 – Geometric Cross Section</li> <li>Chapter 400 – Intersections At Grade</li> </ul> <p>Caltrans Plans Preparation Manual  Caltrans Project Development Procedures Manual  AREMA Manual for Railway Engineering  Conformance with the latest technical specifications and practices of the respective utility owner.  American National Standards Institute (ANSI) Standards</p> <ul style="list-style-type: none"> <li>Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications</li> <li>Standard for Outside Plant Communications Cable</li> <li>Communications Wire and Cable for Wiring of Premises</li> <li>Standard for Fiber Optic Premises Distribution Cable</li> <li>Human Factors Engineering Requirements for Visual Display Terminal (VDT) Work Stations</li> <li>Standard for Tolerance of Radiated Electromagnetic 1 Frequency Interference (RFI)</li> </ul> <p>Electronic Industries Association/Telecommunications Industry Association (EIA/TIA) Standards  Underwriter Laboratories Inc. (UL) Publications</p>
New construction and the protection, support, restoration, and rearrangement of utilities (cont'd.)	Alignment (bridges and viaducts) (cont'd.)	<p>U.S. Department of Defense (USDOD) Standards: MIL-STD-1472: Human Engineering, MIL-STD-781: Reliability, Test Methods, Plans, and Environments for Engineering, 12 Development, Qualification and Production, MIL-STD-810: Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests  National Transportation Communications for ITS Protocol (NTCIP) Standards  Telecommunication Standardization Sector (ITU-T) Standards</p>
Stations and maintenance facility buildings	HST stations and maintenance facility buildings	CHST stations and maintenance facility buildings shall be designed to achieve net-zero site energy, as measured over the course of a year.



**Table 2D-6**  
Hydrology

Impact Category	Project Features	Applicable Design Standards
Alteration of stream flows and water surface elevations from the placement of structures (e.g., piers and abutments) within stream channels.	Alignment (bridges and viaducts) including access track to HMF.	HST Fresno to Bakersfield Section Hydraulics and Floodplains Technical Report Caltrans Highway Design Manual: <ul style="list-style-type: none"> <li>Chapter 810 – Hydrology</li> <li>Chapter 820 – Cross Drainage</li> </ul> FHWA Hydraulic Design Series: <ul style="list-style-type: none"> <li>HDS-1 – Hydraulics of Bridge Waterways</li> <li>HDS-5 – Hydraulic Design of Highway Culverts</li> </ul> AREMA Manual for Railway Engineering AASHTO Highway Drainage Guidelines
Alteration of drainage patterns from placement any type of project feature in any location. Includes changes from impervious surfaces and floodplain impacts.	All project features.	Stormwater Pollution Prevention Plan: <ul style="list-style-type: none"> <li>Hydromodification</li> </ul> HST Fresno to Bakersfield Section Hydraulics and Floodplains Technical Report HST Fresno to Bakersfield Section Stormwater Management Plan Caltrans Highway Design Manual: <ul style="list-style-type: none"> <li>Chapter 820 – Cross Drainage</li> <li>Chapter 830 – Roadway Drainage</li> <li>Chapter 860 – Open Channels</li> </ul> FHWA Hydraulic Design Series No. 2 (Hydrology) FHWA Hydraulic Engineering Circular No. 22 (Urban Drainage Design Manual) AREMA Manual for Railway Engineering AASHTO Highway Drainage Guidelines
Generation of pollution from roadways.	State highway and local roadway modifications and crossings.	Stormwater Pollution Prevention Plan: <ul style="list-style-type: none"> <li>Construction BMPs</li> <li>Post-Construction Controls</li> </ul> HST Fresno to Bakersfield Section Stormwater Management Plan Caltrans Storm Water Quality Handbook: <ul style="list-style-type: none"> <li>Project Planning and Design Guide</li> <li>Stormwater Pollution Prevention Plan and Water Pollution Control Program Preparation Manual</li> </ul> AASHTO Highway Drainage Guidelines
Generation of pollutants from stations	Fresno, Bakersfield, and Kings/Tulare Regional Stations	Stormwater Pollution Prevention Plan: <ul style="list-style-type: none"> <li>Construction BMPs</li> <li>Post Construction Controls</li> <li>Local Standards</li> </ul> HST Fresno to Bakersfield Section Stormwater Management Plan
Generation of pollutants from HMF	All HMF Alternatives	Stormwater Pollution Prevention Plan: <ul style="list-style-type: none"> <li>Construction BMPs</li> <li>Industrial BMPs</li> </ul> HST Fresno to Bakersfield Section Stormwater Management Plan

**Table 2D-7**  
Geology, Soils, and Seismicity

Impact Category	Project Features	Applicable Design Standards
Construction	Backfilling of borings, test pits, Cone Penetration Tests (CPTs), rotosonic holes, wells, and probe holes.	<p>American Association of State Highway and Transportation Officials (AASHTO) Guidance</p> <ul style="list-style-type: none"> <li>AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specification (BDS) with Caltrans Amendments</li> <li>AASHTO Guide Specifications for Design and Construction of Segmental Concrete bridges</li> <li>AASHTO Guide Specifications for Thermal Effects in Concrete Bridge Superstructures</li> </ul> <p>California Department of Transportation (Caltrans)</p> <ul style="list-style-type: none"> <li>Caltrans Seismic Design Criteria (CSDC)</li> </ul> <p>California Building Code (CBC)</p> <p>Federal Highway Administration (FHWA) Guidelines</p> <ul style="list-style-type: none"> <li>FHWA Drilled Shaft Construction Procedures and LRFD Design Methods, FHWA-NHI-22 10-016</li> <li>FHWA Design and Construction of Driven Pile Foundations, Vols. 1 and 2, FHWA-HI-24 97-013 &amp; 0-14</li> <li>FHWA Drilled Shafts: Construction and Procedures and Design Methods, FHWA-IF-99-26 02</li> <li>FHWA Mechanically Stabilized Earth Walls and Reinforced Soil Slope Design and Construction Guidelines, FHWA-NHI-00-043</li> </ul> <p>FHWA Earth Retaining 1 Structures, FHWA-NHI-99-025</p> <ul style="list-style-type: none"> <li>FHWA Soil Slope and Embankment Designs, FHWA-NHI-01-026</li> <li>FHWA Rock Slopes Reference Manual, FHWA-HI-99-00</li> </ul> <p>FHWA Geosynthetics Design and Construction Guidelines, FHWA HI-95-038</p> <p>California Well Standards, Water Wells, Monitoring Wells, Cathodic Protection Wells</p> <ul style="list-style-type: none"> <li>Bulletins 74-81 and 74-90</li> </ul>
Construction	Restoration of pavement.	<p>American Association of State Highway and Transportation Officials (AASHTO) Guidance</p> <ul style="list-style-type: none"> <li>AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specification (BDS) with Caltrans Amendments</li> <li>AASHTO Guide Specifications for Design and Construction of Segmental Concrete bridges</li> <li>AASHTO Guide Specifications for Thermal Effects in Concrete Bridge Superstructures</li> </ul> <p>California Department of Transportation (Caltrans)</p> <ul style="list-style-type: none"> <li>Caltrans Seismic Design Criteria (CSDC)</li> </ul>

**Table 2D-7**  
Geology, Soils, and Seismicity

Impact Category	Project Features	Applicable Design Standards
Construction (cont'd.)	Restoration of pavement (cont'd.)	<p>Federal Highway Administration (FHWA) Guidelines</p> <ul style="list-style-type: none"> <li>FHWA Drilled Shaft Construction Procedures and LRFD Design Methods, FHWA-NHI-22 10-016</li> <li>FHWA Design and Construction of Driven Pile Foundations, Vols. 1 and 2, FHWA-HI-24 97-013 &amp; 0-14</li> <li>FHWA Drilled Shafts: Construction and Procedures and Design Methods, FHWA-IF-99-26 02</li> <li>FHWA Mechanically Stabilized Earth Walls and Reinforced Soil Slope Design and Construction Guidelines, FHWA-NHI-00-043</li> </ul> <p>FHWA Earth Retaining 1 Structures, FHWA-NHI-99-025</p> <ul style="list-style-type: none"> <li>FHWA Soil Slope and Embankment Designs, FHWA-NHI-01-026</li> <li>FHWA Rock Slopes Reference Manual, FHWA-HI-99-00</li> </ul> <p>FHWA Geosynthetics Design and Construction Guidelines, FHWA HI-95-038</p>

**Table 2D-8**  
Hazardous Materials

Impact Category	Project Features	Applicable Design Standards
Construction	HST civil work and track construction (alignment, bridges and viaducts).	HST Fresno to Bakersfield Section Hazardous Materials Technical Report Title 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" Title 49 Part 195, "Transportation of Hazardous Liquids by Pipeline"
Operation of the CHST system and ancillary sources	Alignment (bridges and viaducts).	HST Fresno to Bakersfield Section Hazardous Materials Technical Report

**Table 2D-9**  
Safety and Security

Impact Category	Project Features	Applicable Design Standards
Construction	HST civil work and track construction (alignment, bridges and viaducts).	<p>49 CFR , Part 213, Section 316 for protection of the right-of-way for Class 8 and 9 tracks</p> <p>49 CFR, Part 214, Railroad Workplace Safety</p> <p>California Public Utilities Commission (CPUC) General Order (GO) No. 26-D</p> <p>Federal Railroad Administration (FRA) guidelines regarding the separation and protection of adjacent transportation systems and conventional railroads</p> <p>High-Speed Passenger Rail Safety Strategy published by FRA (November 2009)</p> <p>AREMA Manual for Railway Engineering</p> <p>Caltrans Highway Design Manual</p> <p>Caltrans Plans Preparation Manual</p> <p>Caltrans Project Development Procedures Manual</p>
Operation of the CHST system and ancillary sources	Alignment (bridges and viaducts).	<p>Be fully grade separated at crossings and fully access-controlled</p> <p>Incorporate supervisory control and data acquisition system</p> <p>Incorporate climatic and seismic monitoring systems</p> <p>Crime Prevention Through Environmental Design (CPTED) principles shall be employed in the design of the HST System</p>

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